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| EXAMINER | |
|---|---|
| PARVINI, PEGAH | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/579,406 | UOTANI ET AL. | |
| | Examiner | Art Unit | |
| | PEGAH PARVINI | 1793 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *30 March 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) *30-45* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election of Group I, claims 1-29 in the reply filed on March 30, 2009 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Thus, the non-elected claims 30-45 are withdrawn from further search and examination, and the Election/Restriction has been made Final.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 1-4, 6-8, 10, 12-13, 16, 18, and 23-29** are rejected under 35 U.S.C. **102(e)** as being anticipated by U.S. Patent No. 6,776,810 to Cherian et al.

Cherian et al. disclose a chemical mechanical polishing systems wherein the systems comprises oxidizing agent such as dipersulfates or permanganates or compound containing at least one peroxy group, for example, hydrogen peroxide (column 6, line 55 to column 7, line 10); additionally, the CMP systems comprise a corrosion inhibitor (i.e. a film-forming agent) which

is, for example, a heterocyclic organic compound with at least one 5- or 6-member heterocyclic ring as the active functional group, wherein the heterocyclic ring contains at least one nitrogen atom, for example, an azole compound (column 7, lines 10-22); in other words, Cherian et al. disclose that the film forming (i.e. corrosion inhibiting) agent is an organic compound with "at least" 5- or 6-member heterocyclic ring wherein the ring (i.e. each ring since there are "at least" one ring) contains "at least" one nitrogen atom, for example an azole compound. In other words, there is "at least" one azole compound. It should be, further, noted that Cherian et al., further, disclose the use of poly(vinylimidazole) in CMP composition for performance optimization (column 5, lines 12-26). It is to be noted that polyvinylimidazole falls within the limitation of claim 2 of a compound having three or more azole moieties.

Cherian et al. also refers to the use of a compound such as benzotriazole (i.e. protective film-forming agent) in said system and composition (column 7, lines 20-23). The CMP systems may further comprise a non-ionic surfactant, and a chelating agent, such as amino acids, to enhance the removal rate of the substrate layer being removed (column 7, lines 20-45). The reference, further, discloses the use of inorganic acids such as sulfuric acid as well (column 8, lines 50-55). Furthermore, the reference discloses the use of abrasive particles such as colloidal silica in the system and composition, and discloses the use of about 0.1wt% or more of abrasive particles in the polishing composition (column 6, lines 3-7). In a further embodiment, it discloses the use of 12wt% of silica (column 8, lines 46-65). Also, with reference to pH, Cherian et al. clearly disclose that the pH of the CMP systems is maintained in a range suitable for its intended use; for example, Cherian et al. disclose a pH of about 7 or less when polishing a copper-containing substrate, desirably between about 2 to about 7 to polish platinum containing

substrate, from about 7 to about 9 to polish a ruthenium containing substrate, and from about 7 to about 9 to polish an iridium-containing substrate (column 6, lines 23-55). It is to be noted that the above represented some examples of pHs for substrates; Cherian et al. clearly teach that the pH of the CMP depends on its intended use and several other factors (column 6, lines 23-27). In addition, Cherian et al. disclose the use of compounds such as citric acid and phthalic acid (column 49-55).

With respect to claim 3, it is to be noted that the reference teaches that polyvinylimidazole is used and by nature, this is water soluble, thus reading on the limitation of claim 3.

With further reference to claim 4, it is to be noted that Cherian et al. also disclose the use of polyelectrolytes for performance optimization and refers to poly(vinylimidazole) as one such compounds; the reference further goes on to say that the molecular weight of such polymer/compound is, in an embodiment, from about 20,000 to about 3,000,000, or in a different embodiment, disclose a molecular weight of about 15,000 or more and about 2,000,000 or less (column 5, lines 45-65). With reference to poly(vinylimidazole) having three or more azole moieties, it is to be noted that as clear from the name of said compound, it is a polymer and, as it is known to one of ordinary skill in the art in the field of chemistry, polymers comprise of many monomers and poly(vinylimidazole) is a polymer comprising of many vinylimidazole monomers. Although the reference may not expressly disclose that how many monomers form the poly(vinylimidazole), it is well known in the art that for a compound to be called polymer, it should certainly comprise much more than three monomers. Even if assuming that some polymers comprise of less than three monomers, it should be noted that the broad disclosure of

Cherian et al. disclosing **poly**(vinylimidazole) broadly read on more than three monomers. Finally, it should be noted that vinylimidazole by itself comprises of one azole, but as a polymer, as known in the field of chemistry, it is expected of it to have formed of several, if not unlimited, number of monomers comprising azole groups/moieties.

With respect to claim 6, although the reference is silent as to the claimed amino acids, the limitation of claim 6 is conditional and as can be seen from claim 1, an amino acid is not required.

With further reference to claim 27, it is noted that the limitation directed to the polishing composition being "used for polishing a metal film provided on a substrate having trenches such that the metal film fills the trenches" is an intended use; with reference to statements of intended use, MPEP § 2111.02 states:

> During examination, statements in the preamble reciting the purpose or intended use of the claimed invention must be evaluated to determine whether the recited purpose or intended use results in a structural difference (or, in the case of process claims, manipulative difference) between the claimed invention and the prior art. If so, the recitation serves to limit the claim. See, e.g., *In re Otto*, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

With further reference to claim 28, it is noted that although Cherian et al. may not expressly teach a ratio ($P_{RR}/B_{RR}$), between a metal film polishing rate ($P_{RR}$) for polishing a metal film formed on a substrate having trenches such that the metal film fills the trenches, or polishing a metal film formed on a substrate having trenches and a barrier metal film formed on the substrate such that the metal film fills the trenches, and a metal film polishing rate ($B_{RR}$) for polishing a flat blanket metal film as being 3.5 or more, the reference teaches a substantially

same polishing composition as that claimed in the instant invention; therefore, said characteristic/property of a ratio of $P_{RR}/B_{RR}$ being 3.5 or more is assumed to be inherent to the composition of the reference since substantially the same compositions cannot have mutually exclusive properties. See MPEP § 2112.01.

With further reference to claim 29, it is noted that said claim is a product-by-process claim. Regarding product-by-process claims, MPEP § 2113 states:

> "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

The limitations directed to the method for producing the claimed composition are not considered to add patentable weight to the examination of the product claims. It is well settled that if the Examiner can find a product in the prior art that is the same or so similar as to have been obvious, the burden can be shifted to the Applicant to demonstrate that the process for producing the composition somehow imparts a patentable distinction to the composition under examination.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This is an alternative rejection to the one above.

**Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Cherian et al., as applied to claim 1 above, and further as evidenced by U.S. Patent No. 3,256,140 to Poschmann.

Cherian et al. disclose a CMP system and composition as detailed out above. Cherian et al. disclose the use of poly(vinylimidazole); although the reference may not literally disclose that said compound is water-soluble, the water solubility of poly(vinylimidazole) would have been obvious to a person of ordinary skill in the art since this compound is a water-soluble compound as that evidenced by Poschmann (Column 1, lines 39-42).

It is to be noted that Poschmann is merely relied on as to show that poly(vinylimidazole) is a water soluble compound. Water solubility is a property/characteristic of a compound.

The rejection of claim 6 is an alternative rejection to the one above.

**Claims 6 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherian et al., as applied to claim 1 above, and further in view of U.S. Patent Application Publication No. 2005/0092620 to Mavliev et al.

Cherian et al. disclose a CMP system and composition as detailed out above. Additionally, Cherian et al. disclose the use of suitable chelating or complexing agents such as amino acids. Cherian et al. do not expressly disclose the use of glycine as an amino acid used in polishing compositions; also, said reference does not expressly disclose the content of amino acid, organic acid or inorganic acid.

However, Mavliev et al., drawn to CMP compositions, disclose the use of chelating agents such as glycine (i.e. amino acid); the reference discloses the use of an amount of from 0.1 to 15% by weight of it ([0093-[0094]]). It is to be noted that overlapping ranges have been held to establish *prima facie* obviousness. MPEP § 2144.05.

Thus, it would have been obvious to a person of ordinary skill in the art to have utilized glycine as the amino acid used in Cherian et al. motivated by the fact that Cherian et al. discloses that an amino acid chelating agent can be used and as is shown by Mavliev et al., glycine is a well known conventional amino acid chelating agent. In addition, this is further motivated by the fact that Cherian et al. expressly disclose that the choice of chelating or complexing agent (i.e. amino acids) depends on the type of substrate layer being removed (column 7, lines 38-48) and Mavliev et al. shows that this specific amino acid is used for polishing the metal conductive layer substrate. Therefore, the proper choice of such compounds such as amino acids, for example, glycine, is determined through routine experimentation with the aim of optimizing the polishing process on a specific substrate layer. Based on Mavliev et al., the use of glycine in polishing compositions is within the scope of a skilled artisan. With respect to the amount, one skilled in the art would have appreciated the amount for this component to be consistent with amounts conventionally known for the same purpose, said amounts being consistent with those disclose by Mavliev et al.

**Claims 11 and 20-22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherian et al. as applied to claims 1 and 12 above, and further in view of U.S. Patent No. 6,454,819 to Yano et al.

Regarding claim 11, Cherian et al. disclose a CMP system and composition as detailed out above. The reference does not expressly disclose an alkylaromatic sulfonic acid or salt thereof or any of the other surfactants recited in claim 14 as the surfactant used; also, Cherian et al. do not expressly disclose the amount of surfactant utilized or the amount of oxidizing agents.

Yano et al., drawn to polishing compositions which comprise oxidizing agents, surfactants, organic acids, chelating agents such as some of the azole compounds, for example, triazole, benzimidazole, or other chelating agents, and other components. Additionally, Yano et al. disclose the use of 0.1-15 parts of oxidizing agent such as permanganate and many more or a combination of different oxidizing agents (column 10, line 50 to column 11, line 10). Yano et al. disclose that oxidizing agents vastly increase the polishing rate for polishing of metal layers and of working films or wafers. Furthermore, Yano et al. teach that a sufficient improvement in the polishing rate is achieved with a content of 15 parts. With reference to the overlapping ranges of the content of surfactants and oxidizing agents, it is to be noted that overlapping ranges have been held to establish *prima facie* obviousness. MPEP § 2144.05.

With respect the amount of oxidizer, Cherian literally teaches that this component can be present and although no amounts are disclosed, one skilled in the art would have appreciated the amount for this component to be consistent with amounts conventionally known for the same purpose, said amounts being consistent with those disclose by Yano. Additionally, oxidizing agents vastly increase the polishing rate for polishing of metal layers and particularly of working films of wafers, and that a sufficient improvement is achieved in the polishing rate by including 15 parts of oxidizing agents.

Regarding claims 20-22, Cherian et al. disclose a CMP system and composition as detailed out above for claims 1 and 12. The reference, however, does not expressly disclose the use of an alkali substance or its amount in their polishing compositions.

Yano et al., drawn to polishing compositions which comprise oxidizing agents, surfactants, organic acids, chelating agents such as some of the azole compounds, for example, triazole, benzimidazole, or other chelating agents, and other components, disclose the addition of alkali compounds such as ammonia, inorganic alkali salt or others in order to adjust the pH which helps improve the dispersability and stability of the aqueous dispersion composition (column 12, lines 35-40). The reference, further, discloses the use of potassium hydroxide (i.e. an alkali metal compound) in an amount which would roughly equates a content of about 0.02wt% of said alkali metal compound in a polishing composition (Example 1, column 15).

Thus, it would have been obvious to one ordinary skill in the art to modify Cherian et al. in order to include addition of an alkali compound such as ammonia or inorganic alkali salts to the polishing composition as that taught by Yano et al. motivated by the fact that such compounds helps adjust the pH, also, improve the dispersibility and stability of the aqueous dispersion composition.

In addition, as can be seen from the examples, the reference discloses the use of a small amount of an alkali substance (e.g. potassium hydroxide, ammonia water, sodium persulfate, etc.) such as about 0.02wt% in said polishing compositions; nevertheless, the use of a small amount of an alkali substance in a polishing composition would have been obvious to a person ordinary skill in the art motivated by the fact that said substance is used to adjust the pH; thus, it

is apparent that the suitable amount of it can be verified through routine experimentation to one of ordinary skill in the art based on different and specific polishing compositions.

**Claims 14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherian et al. as applied to claims 1 and 12 above, and further in view of U.S. Patent Application Publication No. 2003/0022502 to Matsui et al.

With respect to the surfactant type, the primary reference, however, teaches that a nonionic surfactant can be added (surfactant is not limited as is evident by the reference only teaching examples). The claimed specific surfactant (i.e. fatty acid salt) is a known nonionic surfactant as is clearly shown by the secondary reference in section [0186] and therefore the use thereof is well within the level of ordinary skill in the art because the primary reference implies that any nonionic surfactant can be used. In other words, the use of any nonionic surfactant is obvious to the skilled artisan, especially known nonionic surfactants, as shown by the secondary reference.

In addition, it is the examiners position that the substitution of one known functionally equivalent surfactant for another that is known to be used for the same purpose (provide surface active capabilities) is well within the scoop of the skilled artisan. Burden is upon applicants to show clear evidence as to why one could never interchange one surfactant for another when they are both used for the same purpose.

With respect to the amount, one skilled in the art would have appreciated the amount for this component to be consistent with amounts conventionally known for the same purpose, said amounts being consistent with those disclose by Matsui et al. in section [0187].

**Claims 17 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherian et al., as applied to claim 1 above, and further in view of U.S. Patent Application Publication No. 2002/0031985 to Wang et al.

Cherian et al. disclose a CMP system and composition as detailed out above. Cherian et al. do no expressly disclose the amount of the poly(vinylimidazole) or the film-forming agents (i.e. corrosion inhibitors) utilized.

Wang et al., drawn to method and composition for planarizing a substrate surface, disclose a composition comprising components such as oxidizers, chelating agent, complexing agent, abrasive particles and more (Abstract). In addition, Wang et al. disclose that the composition may include corrosion inhibitors in an amount of between about 0.01wt% to about 0.04wt% ([0052]). It is to be noted that Wang et al. teach that suitable corrosion inhibitors include compounds which contain cyclic nitrogen compound such as those containing one or more azole groups ([0052]).

Therefore, it would have been obvious to a person or ordinary skill in the art to have modified Cherian et al. in order to include an amount of between about 0.01wt% to about 0.04wt% of corrosion inhibitors which include cyclic nitrogen compounds such as those containing one or more azole groups as that taught by Wang et al. motivated by the fact that Wang et al. disclose that their composition has extended pot life and has further advantages such as being able to remove the desired copper material from the substrate without overpolishing ([0011]-[0012]). Further motivation would be the fact that the two references are from the same field of art; additionally, Wang et al. disclose the use of components such as those disclosed by Cherian et al. having overlapping ranges, if no anticipatory ranges, of amounts of components

with the ones recited in instant application. Overlapping ranges have been held to establish *prima facie* obviousness. MPEP § 2144.05.

**Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Cherian et al. as applied to claim 1 above.

With respect to the amount of poly(vinylimidazole), although this reference does not literally teach an amount for this specific component, looking at example 2, the reference discloses that the amount of polyethyleneimine is 0.625 weight percent. Polyethyleneimine is disclosed as one possible polyelectrolyte (see column 5, lines 19-30) and since the reference also discloses that poly(vinylimidazole) is a possible polyelectrolyte as a substitute for poly(vinylimidazole), it is the examiners position that the skilled artisan would have readily appreciated that the amount for poly(vinylimidazole) be reasonably similar to the literal amount disclose by the reference for polyethyleneimine (i.e. both of these polymers are the polyelectrolytes usable by the reference thus one would clearly appreciate that the amount used must also be relatively similar and now burden is upon applicants to establish clear evidence otherwise).

***Response to Arguments***

Applicants' arguments filed March 30, 2009 have been fully considered but they are not persuasive.

Applicants' argument with reference to Cherian et al. regarding three or more azole moieties is not found persuasive because as detailed out in the previous Office action, Cherian et

al. in column 7, lines 15-20 disclose "the film forming agent is a heterocyclic organic compound with at least one 5- or 6-member heterocyclic ring as the active functional group, wherein the heterocyclic ring contains at least one nitrogen atom, for example, an azole compound". It appears that Applicants have misinterpreted the section cited above (which was also cited in the previous Office action) to have disclosed a compound of one azole group; whereas, in fact, that section of Cherian et al. disclose that the film forming (i.e. corrosion inhibiting) agent is an organic compound with "at least" 5- or 6-member heterocyclic ring wherein the ring (i.e. each ring since there are "at least" one ring) contains "at least" one nitrogen atom, for example an azole compound. In other words, there is "at least" one azole compound.

Additionally applicants admit that an azole moiety by definition contains "a 5-membered nitrogen heterocyclic ring" and the reference discloses at least one 5- or 6-member heterocyclic ring as the active functional group, and at least clearly include three or more.

Additionally, Cherian et al. in column 5, lines 23-27 disclose the composition also contains poly(vinylimidazole) and this is applicant's azole compound as clearly disclosed on page 57, lines 26-30 of the specification.

Applicants' arguments, see page 3, filed March 30, 2009, with respect to the rejection(s) under Li et al. have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Cherian et al. in view of a number of secondary references as detailed out above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PEGAH PARVINI whose telephone number is (571)272-2639. The examiner can normally be reached on Monday to Friday 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on 571-272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Pegah Parvini/
Examiner, Art Unit 1793

/Michael A Marcheschi/
Primary Examiner, Art Unit 1793